

# ATTEMPTED AND COMPLETED SUICIDE IN ADOLESCENCE

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■ **Abstract** Suicide is the third leading cause of death in adolescence, and medically serious suicide attempts occur in approximately 3% of adolescents. This review examines a number of risk factors that contribute to suicidal behavior. A prior suicide attempt is one of the best predictors of both a repeat attempt and eventual completed suicide. Depression, disruptive behavior disorders, and substance-use disorders also place adolescents at high risk for suicidal behavior, with comorbidity further increasing risk. Research on families indicates that suicidal behavior is transmitted through families. Groups at high risk for suicidal behavior include gay, lesbian, and bisexual youths, incarcerated adolescents, and homeless/runaway teens. Although abnormalities in the serotonergic system have not been consistently linked to suicidal behavior, genetic and neurobiologic studies suggest that impulsive aggression may be the mechanism through which decreased serotonergic activity is related to suicidal behavior. Findings from prevention and intervention studies are modest and indicate the need for substantially more theory-driven treatment research.

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INTRODUCTION

Suicide completion is the third leading cause of death for children, adolescents, and young adults (10 to 24 years old) in the United States (Kochanek et al. 2004). After puberty, rates of suicide increase with age until they stabilize in young adulthood. This increase in suicide may be associated with the onset and increase in depressive and substance-use disorders during adolescence as compared to childhood (Shaffer et al. 1996a) as well as greater suicidal intent with age (Brent et al. 1999). As with adult males, adolescent males complete suicide at rates approximately five times higher than rates for adolescent females (Kochanek et al. 2004). One reason for the lower rates of death in females than in males is that the preferred method of attempt in females is overdoses, which are treated more effectively in Western countries than are attempts by other means, such as firearm use or hanging. In addition, as discussed below, completed suicide is often associated with conduct difficulties/aggressive behavior and substance abuse, both of which are more common in males than in females (Brent et al. 1999).

The rate of suicide rose to 11.1 per 100,000 for youths 15 to 19 years of age in the mid-1990s. The increase in the rate of suicide from the 1970s, through the early 1990s has been attributed to rising rates of depression, the increased availability of firearms, and an increase in substance abuse among adolescents (Commission on Adolescent Suicide Prevention 2005). Data from the Centers for Disease Control (2004) indicate that death by firearms (49%) is the leading cause of death for persons between 10 and 19 years of age, followed by suffocation (mostly hanging; 38%) and then poisoning (7%).

White youths complete suicide at higher rates than African Americans and Latinos (Kochanek et al. 2004). Asian/Pacific Islanders have the lowest rates, while Native Americans have the highest rates of suicide among youths. The high rates among Native Americans have been related to low social integration, access to firearms, and substance abuse (Middlebrook et al. 2001). The low rates among African Americans have been attributed to a greater emphasis on religion in

African American families. However, the difference in rates of completed suicide between African Americans and whites has decreased over the past 15 years: The adolescent male suicide rate among whites began to stabilize in 1988 and then decreased in the mid 1990s after a 25-year period of increase from 1969 to 1988. In fact, by 2002, the rate of completed suicide decreased to 7.4 per 100,000 for all adolescents (Kochanek et al. 2004). It is unclear why this decrease occurred. Olfson et al. (2002) note there was more than a threefold increase in antidepressant use by adolescents between 1987 and 1996, which might account for the decrease in suicide. In addition, suicide awareness programs were introduced into high schools during the mid 1980s.

## Attempted Suicide

Rates of attempted suicide rise precipitously during adolescence (Kessler et al. 1999). Borst et al. (1991) postulate that with the advent of puberty, social-cognitive changes lead to more internal than external attributions of unhappiness. This shift in attributional style leads to more self-blame in response to interpersonal stressors and in some adolescents results in suicidal behavior. Data obtained through the 2003 Youth Risk Behavior Surveillance (YRBS) survey, from more than 15,000 high school students in 32 states and 18 local municipalities, indicated that within a twelve-month period, 16.9% of adolescents seriously consider attempting suicide, 16.5% develop a suicide plan, 8.5% attempt suicide (female, 11.5%; male, 5.4%), and 2.9% of adolescents attempt suicide in a manner requiring emergency medical treatment (Grunbaum et al. 2004).

Hispanic adolescents consistently report higher rates of suicide attempts than other groups. In the Grunbaum et al. (2004) survey, 6.9% of white adolescents reported having attempted suicide in the prior year, compared with 8.4% of black adolescents and 10.6% of Hispanic adolescents. Suicide attempts were higher among Hispanic females (15.0%) than among white females (10.3%) and black females (9.0%), and higher among black (7.7%) and Hispanic (6.1%) males than among white males (3.7%). Suicide attempts that required medical attention were higher among blacks (3.7%) and Hispanic adolescents (5.0%) than among whites (1.7%).

Disparities between adolescent and parent acculturation, socioeconomic disadvantage, traditional gender-role socialization, and intergenerational conflict create conditions that are believed to lead to adolescent suicidal behavior in Hispanic families (Zayas et al. 2000). Traditionally structured Hispanic families often have restrictive, authoritarian parenting styles, which may affect the development of adolescent females moving toward autonomy, even when the father is absent (Zayas et al. 2000). In addition, extended family support, traditionally used to help parents manage these issues, is often limited due to immigration.

Native Americans also report very high rates of attempted suicide during adolescence. The National American Indian Adolescent Health Survey (Borowsky et al. 1999) sampled more than 11,000 Native American students in schools on

reservations in eight Indian Health Service areas. The overall rate of lifetime suicide attempts was 16.8%, and the rate for girls in particular was 21.8%. However, the rates also varied considerably across tribes.

## PRIMARY INDIVIDUAL RISK FACTORS

A number of primary cognitive, behavioral, and emotional factors are risk factors for suicide attempts and completed suicide by adolescents. In this section, we review selected factors and their relation to suicidal behavior. With the exception of prior suicide attempts, these risk factors are not specific to suicidal behavior, but have been found to be associated with other mental health problems among adolescents, particularly internalizing disorders. We draw upon thorough reviews prepared by Evans et al. (2004), Gould et al. (2003), and Spirito & Overholser (2003) in offering conclusions regarding the empirical support for each risk factor. We provide an overview of each risk factor followed by a few selected studies to exemplify findings. Particular attention is paid to cognitive processes that may underlie various risk factors, particularly emotional and behavioral states.

### Prior Suicidal Behavior

A previous suicide attempt is one of the best predictors of eventual completed suicide (Shaffer et al. 1996a) and future suicide attempts (Lewinsohn et al. 1994) among adolescents. Prior suicide attempts are estimated to occur in 25% to 33% of all completed suicides, with the risk of completed suicide higher for boys (30-fold) than for girls (3-fold) (Shaffer et al. 1996a). A prior suicide attempt has also been found to increase the likelihood of a future attempt 18-fold (Lewinsohn et al. 1994). Goldston et al. (1999) followed 180 psychiatrically hospitalized adolescents, approximately 40% of whom had made a prior suicide attempt. The number of prior attempts was the strongest predictor of a posthospitalization suicide attempt.

Adolescent attempters may be at risk for eventual completed suicide because prior suicidal experiences sensitize the individual to suicide-related thoughts and behaviors (Beck 1996). Once the taboo against suicide has been broken, it may become easier to view suicide as a viable solution when confronted with a stressor. Moreover, greater repetition of suicidal behavior is associated with more severe psychiatric disturbance. Hawton and colleagues (1999) examined a population of suicide attempters seen in a general hospital. In comparison with first-time attempters, the multiple attempters had higher scores on measure of depression, hopelessness, and trait anger, and lower scores on self-esteem and problem solving. The combination of the repetitive sensitization of the suicidal experience and severe psychiatric disturbance may place multiple attempters at particularly high risk for completed suicide.

## Emotional States

Although depression is most commonly thought of as the primary emotion that accompanies suicidal behavior, not all adolescent suicide attempters are depressed. Other emotional states, such as anxiety and anger, are equally important to consider in understanding a suicide attempt. However, even during the course of a mood or anxiety disorder, only a small percentage of adolescents make a suicide attempt.

**DEPRESSED MOOD** Much research has been conducted to examine the relation between depressed mood and suicide attempts across adolescent clinical and community samples. Strong empirical support exists for the importance of depressed mood in a significant proportion of adolescent suicide attempts (Evans et al. 2004). Specific depressive symptoms, i.e., emotional lability and withdrawal, may be particularly important in suicidal behavior (Wolfsdorf et al. 2003). Furthermore, severity of depressed mood may vary as a function of suicide history. Goldston and colleagues (1996) found higher levels of depressive symptoms among repeat suicide attempters (those who made a second or subsequent attempt within the last two weeks) and previous attempters (those who did not make an attempt in the last two weeks but did have a prior attempt) than among patients with no history of suicide attempts. However, these investigators did not find a difference between levels of depressive symptoms among first-time attempters (those who made their first attempt within the last two weeks) and patients with no history of attempts. Thus, multiple suicide attempts may be related to severe depression, whereas a first-time attempt may be related to other mood states as well as cognitive and behavioral factors.

Mood disorders have consistently been found among adolescents who complete suicide (Gould et al. 2003). In a review of seven psychological autopsy studies of completed suicide, Flisher (1999) found that rates of major depression ranged from 23% to 52%. Depression is also common in attempted suicide. Brent et al. (1993a) followed adolescent inpatients, with and without a history of suicidal ideation and attempts, six months after their discharge from the hospital. Risk factors for a suicide attempt at follow-up included a diagnosis of major depression at their first psychiatric hospitalization, the presence of an affective disorder with comorbidity, and the presence of a depressive disorder that persisted through the follow-up period.

**ANGER** Anger may be independently related to suicidal behavior or viewed as a symptom of a psychiatric disorder, i.e., depression and/or conduct disorder. Stein et al. (1998) found that adolescent inpatients, including first-time attempters, repeat attempters, and nonsuicidal inpatient controls, reported more anger than did community controls, but only repeat attempters reported more anger than nonsuicidal inpatients. Goldston et al. (1996) found no differences in levels of state anger, i.e., anger at the time of the attempt, among adolescent inpatients who had recently made a first suicide attempt, recently made a repeat attempt, or had a previous (but not current) attempt, and those who had never attempted

suicide. However, trait anger (anger more characteristic of the adolescent's typical functioning) was higher among previous (but not current) attempters than among all other inpatient groups in the study.

Some adolescents may engage in suicidal behavior as a means to permanently end or cope with unresolved anger. Boergers et al. (1998) found anger expression to be greater among adolescent attempters who report a wish to die as a reason for their attempt compared with attempters who endorse other motivations, such as to obtain relief from a stressful situation. Negron et al. (1997) conducted detailed retrospective interviews with suicidal adolescents and found that anger increased from pre-episode levels for both suicide ideators and attempters during the suicidal act. Following the suicidal act, suicide attempters reported a greater decrease in anger than did the ideators, which suggests that a suicide attempt may effectively decrease anger-related emotional arousal for some adolescents and/or temporarily suspend situations that provoke intense anger.

**ANXIETY** Adolescent suicide attempters have been found to experience more anxiety than their nonattempting counterparts. Stein and colleagues (1998) examined psychiatric inpatients and found that first-time attempters reported more trait anxiety than did nonsuicidal inpatients and community controls, and that both first-time and repeat attempters reported more state anxiety than did nonsuicidal inpatients and community controls. In addition, consistent with reports by the adolescents, interviewers rated state and trait anxiety among first-time attempters as higher than that among community controls (Stein et al. 1998). Similarly, Ohring et al. (1996) found that inpatient adolescent attempters demonstrated higher levels of state and trait anxiety than did nonsuicidal inpatients. When they controlled for depression, however, differences between the two groups remained only for trait anxiety. In addition, Goldston et al. (1996) found stronger evidence for the relation between trait anxiety and suicidality than for the relation between state anxiety and suicidality in an inpatient sample. Repeat attempters and previous attempters reported more trait anxiety than did nonattempting adolescents.

In comparison with research examining the relation between depression and suicidality, findings for anxiety disorders are less consistent. Gould et al. (1998) examined data from the Methods for Epidemiology of Child and Adolescent Mental Disorders (MECA) and found that an anxiety disorder increased the risk for a suicide attempt in this community sample. Pilowsky et al. (1999) reported on a community-based sample of 13- and 14-year-old adolescents composed mainly of African American youths. After controlling for demographics, major depression, and alcohol/drug use, adolescents with a history of panic attacks were twice as likely to have made suicide attempts as adolescents without a history of panic attacks. However, Strauss et al. (2000) did not find differences in anxiety disorders across attempters, ideators, or nonsuicidal controls in a large outpatient clinical sample.

Anxiety may be related to suicidal behavior, in part, through cognitive distortions associated with anxious states. Adolescents with anxiety disorders tend to

have a lower threshold for perceived threat, underestimate their competency in dealing with perceived threat, and expect negative outcomes in threatening situations (Bogels & Zitgerman 2000). Over time, such anxious thoughts may become overwhelming, especially when combined with depression-related cognitive distortions (see discussion of comorbidity below), as anxiety and mood disorders often co-occur. Under such conditions, suicidal behavior may be considered as a means of escape.

## Behavioral Factors

Impulsive and aggressive behaviors often co-occur and have been related to suicidal behavior (see, e.g., McKeown et al. 1998), especially in adolescents with affective disorders (Brent et al. 1994a). Pfeffer et al. (1995) conducted a longitudinal study to examine the role of impulsivity in child and adolescent suicide attempts among psychiatrically hospitalized children followed up six to eight years later. Patients were assigned to a "good" outcome group if they did not have a history of suicidality previous to study entry and did not make a suicide attempt during the follow-up, a "poor" outcome group if they made a suicide attempt during the follow-up period, and an "improved" outcome group if they reported suicidal ideation or behavior previous to study entry but demonstrated no suicidality during the follow-up period. Children and adolescents with a good course were found to have significantly better impulse control than those with an improved or poor course. Horesh et al. (1999) also found a relationship between impulsivity and suicidality. However, this relationship was no longer significant when aggressive feelings and aggressive conduct were partialled out of the analyses. Thus, in some adolescents, aggressive tendencies may play a stronger role than impulsivity in suicide risk.

In regard to research on aggression and violence in particular, Vannatta (1996) used a community sample of more than 3000 seventh- through twelfth-grade students and found that frequency of aggressive and violent behaviors increased with level of suicidality (from no suicidality to suicide attempt). These behaviors included trouble with police, physical fighting, and property damage. In contrast to the relationship found in community samples, studies conducted with clinical populations have not consistently found a relationship between aggressive and suicidal behavior. Brent et al. (1993b) compared inpatient suicide attempters with never-suicidal psychiatric controls. The attempter group, compared with controls, did not differ on lifetime history of aggression, assaultive behavior, or tendency toward impulsive aggression.

Research examining the link between disruptive behavior disorders and suicidality is mixed. Fergusson & Lynskey (1995) followed a birth cohort of New Zealand children to the age of 16 and found youths with conduct/oppositional defiant disorders to be 13.2 times more likely to attempt suicide. Beautrais et al. (1996), using a case control design and adjusting for the effects of comorbid disorders, found that adolescents and young adults (ages 13–24) with a diagnosis of conduct or antisocial personality disorder were 4.4 times more likely to have made

a serious suicide attempt. Gould et al. (1998), using data collected from the MECA study, did not find an independent contribution of disruptive behavior disorder to suicide attempts. Aggressiveness, however, was a significant predictor of suicidal ideation, even after controlling for the presence of a psychiatric disorder.

In contrast to research examining impulsivity and aggression independently, impulsive aggression, i.e., quickly responding with heightened levels of hostility/anger to frustration or confrontation, has consistently been related to suicidal behavior (see Brent & Mann 2005). Furthermore, research suggests that impulsive aggression may be genetically transmitted. In one study (Brent et al. 2003), level of genetic loading for this trait was investigated by comparing parents who attempted suicide and also had a sibling who attempted suicide to parents who attempted but who did not have a sibling who made a suicide attempt and parents who never made an attempt and whose siblings also did not attempt. Results suggested that the higher the genetic risk, the greater the likelihood of the adolescent offspring attempting suicide. Furthermore, impulsive aggression was the strongest predictor of an attempt and was highest in the suicide attempters with siblings concordant for suicidal behavior.

In addition to genetics, aggression-related cognitive distortions, i.e., hostility bias, may in part be responsible for the link between aggression and suicidality. Adolescents who consistently misperceive hostility in interactions with others may feel persecuted and victimized. Further, they may lose their affiliations with healthy peers by responding to their distorted perceptions of hostility with aggression. Aggressive responding in ambiguous situations, when considered unwarranted by peers, can bring about peer rejection. Over time, misperceptions of hostility and related negative feedback may become increasingly overwhelming for adolescents, at which point suicide may be considered as a viable option for escape, especially when adolescents also have concurrent problem-solving deficiencies (see below).

## Substance Use Disorders

A relatively strong relationship has been found between substance use disorders and suicide completion in adolescents (see Esposito-Smythers & Spirito 2004 for review). In one of the largest and most well-controlled psychological autopsy studies conducted to date in the United States (Shaffer et al. 1996b), 120 adolescents (aged <20 years) who committed suicide were compared to an age-, gender-, and race-matched community control sample of 147 adolescents. Thirty-five percent of suicide completers met criteria for any substance abuse disorder, 22% for alcohol abuse, and 25% for illicit drug abuse. The presence of any substance abuse disorder was six times greater among male adolescent suicide completers in comparison with matched community controls. In a case-control study, Hawton et al. (1993) examined risk for eventual completed suicide in adolescents and young adults (aged 13–24 years) admitted to a general hospital in Oxford following a suicide attempt. Adolescents who completed suicide were almost four times more likely to report misuse of alcohol, drugs, or both than were adolescents who made only nonfatal attempts.



A relationship has also been found between substance use disorders and suicide attempts. Mehlenbeck et al. (2003) reviewed the literature and concluded that adolescent suicide attempters exhibit elevated rates (25% to 50%) of substance use and diagnosable substance use disorders. Rates differed in part as a function of the substance use dimension assessed (general substance use versus substance use disorder), place of recruitment (psychiatric inpatient versus general hospital), method of diagnostic assessment (semistructured diagnostic interview versus clinical interview), and age of the sample. Research comparing rates of substance use disorders and severity of suicidal behavior in adolescents has also revealed a positive association. D'Eramo et al. (2004) assessed adolescents admitted to a psychiatric inpatient unit. Multiple attempters were more likely to meet criteria for a substance use disorder (57.1%) than were single attempters (21.4%), suicide ideators (16.1%), and nonsuicidal adolescents (18.5%). This pattern held for diagnoses of both alcohol use disorder and cannabis use disorder.

Why is substance use related to suicidal behavior? First, substance use disorders may be associated with increases in stress and co-occurring psychopathology, which, in turn, increases risk for suicidal behavior. Over time, stress resulting from substance-related social, academic, and/or legal problems, when combined with depressive symptoms, may reach a level where a suicide attempt is viewed as a means to cope with perceived insurmountable difficulties and emotional arousal. Second, substance use has been hypothesized to exacerbate psychological symptoms such as depression and disruptive behavior among adolescents (Greenbaum et al. 1996). For example, King et al. (1996) found that the depressive episodes experienced by adolescent females who abuse alcohol or other drugs have an earlier onset and longer duration than those experienced by females who do not abuse substances.

Third, excessive alcohol use heightens distress, increases anger and aggressive behavior toward self and others, enhances suicide-specific alcohol expectancies (e.g., "alcohol will give me the courage to make a suicide attempt"), and inhibits adaptive coping. This concurrent increase in psychological distress, aggressiveness, and cognitive distortion may result in suicidal behavior in vulnerable individuals (see Hufford 2001 for detailed review).

There is evidence that a pattern of heterotypic comorbidity (internalizing and externalizing diagnoses) is particularly risky for completed and attempted suicide. Shaffer et al. (1996b) found that a mood disorder alone, or in combination with a conduct disorder or substance abuse, characterized adolescents who completed suicide. However, a substance use disorder alone was a risk factor for males only. Using a case-control design, Brent et al. (1993c) compared 67 suicide victims to 67 matched community controls. Adolescents diagnosed with comorbid substance use and mood disorders were found to be at significantly greater risk of completed suicide (odds ratio = 17.0) than were adolescent substance abusers without a comorbid mood disorder (odds ratio = 3.3).

Comorbidity has also been shown to increase the risk for attempted suicide. Kovacs et al. (1993) followed depressed child and adolescent outpatients and non-depressed psychiatric outpatient controls for a span of up to 12 years. A diagnosis of

substance use and/or conduct disorder in the presence of a mood disorder increased risk of a suicide attempt over that of a substance use and/or conduct disorder diagnosis alone. Similar results were reported by Gould et al. (1998), who found that rates of suicide attempts in depressed adolescents further increased when they were diagnosed with a comorbid anxiety disorder and/or disruptive behavior disorder than when they were diagnosed with either disorder alone. Lewinsohn et al. (1995) found that adolescent substance abusers diagnosed with comorbid major depression, disruptive behavior disorders, or anxiety disorders were three to four times more likely to have a history of a suicide attempt than were those without these comorbid disorders. Finally, using a longitudinal design, Reinherz et al. (1995) found that the odds of attempting suicide were 17 times greater among adolescents diagnosed with substance use and mood disorders by age 14 in comparison to those without these early co-occurring diagnoses.

Adolescents with comorbid conditions may experience cognitive distortions associated with each independent diagnosis, which leads to a severe dysfunctional cognitive state. This increase in cognitive dysfunction may be responsible for the increased risk of suicidal behavior found in comorbid conditions. In studies with community samples, depressed/anxious adolescents reported more distorted cognitive processes than depressed-only and control groups (Ronan & Kendall 1997). In another study using a community sample, comorbid (aggressive/delinquent and depressed/anxious) and internalizing groups reported worse cognitive distortions than the externalizing and control groups (Epkins 2000).

## COGNITIVE FACTORS

Maladaptive cognitive processes frequently play an important role in suicidal behavior. One study examined the association between cognitive distortions and suicidality, and found that suicide-attempting and/or suicide-ideating adolescent inpatients with a mood disorder had higher catastrophization, personalization, selective abstraction, overgeneralization, and total cognitive errors than did non-suicidal adolescents with a mood disorder (Brent et al. 1990). Hopelessness and perceived problem-solving deficiencies have received the most investigation.

### Hopelessness

Hopelessness is a cognitive state that often accompanies depression and is reported by many adolescents who attempt suicide. Hopelessness entails a lowered expectation of obtaining certain goals and is accompanied by feelings of personal futility, loss of motivation, and the expectation that the future will yield negative personal consequences. In a study comparing depressed attempters and depressed nonattempters, McLaughlin et al. (1996) found that a much larger proportion of the suicide attempters reported higher levels of hopelessness. Dori & Overholser (1999) also found that adolescents who reported higher levels of hopelessness

during a depressive episode were more likely to have attempted suicide. Goldston et al. (2001) followed adolescents who had been hospitalized on a psychiatric inpatient unit up to six years following their discharge. Among adolescents who had attempted suicide prior to the initial hospitalization, higher levels of hopelessness increased the risk for repeat suicide attempts.

Although numerous studies have demonstrated a relation between hopelessness and adolescent suicide attempts, hopelessness does not consistently predict suicidality once depression is controlled (see Esposito et al. 2003). It has been suggested that hopelessness may place adolescents at risk for suicidal behavior for only a limited period during a depressive episode (Dori & Overholser 1999). The potential time-limited nature of hopelessness may explain the contradictory results found in many studies.

## Problem Solving

A fair amount of research has been conducted on problem solving in suicidal adolescents. In one study, most adolescents (68%) who attempted suicide expected that it would positively influence their problems, by either leading to death, temporary relief from problems, or communicating their level of pain to others, and 38% reported that they were unable to think of anything else to do to solve their problems (McLaughlin et al. 1996). This study suggests that suicidal behavior may result from the use of ineffective problem-solving alternatives and/or an inability to generate effective alternative solutions to problems.

Studies employing self-report paper-and-pencil measures have consistently revealed that suicidal adolescents (attempters and/or ideators), in comparison with nonsuicidal adolescents, report greater difficulty in generating alternatives to problems and choosing/implementing effective alternatives (see Esposito et al. 2003 for review). Results with performance-based measures of social problem-solving skills have been mixed, possibly because such measures do not prompt for the generation of multiple solutions and deficiencies in problem solving may only emerge in the generation of second and later solutions to problems. Nonetheless, Wilson et al. (1996) reported that adolescent suicide attempters use fewer problem-focused coping strategies than do their healthy counterparts in relatively controllable situations. Suicidal youths may believe they cannot resolve their problems regardless of their potential options. This perception of problem irresolvability and subsequent deficient problem solving may be what differentiates attempters from nonsuicidal adolescents (Orbach et al. 1999).

## FAMILY FACTORS

Wagner et al. (2003) note that low cohesion, high conflict, and unsatisfying parent-adolescent relationships are more frequently seen in the families of adolescents who attempt and complete suicide than in controls. However, these family variables are

often insignificant when other related factors such as adolescent psychopathology are taken into account (Gould et al. 2003). Below, we focus on family transmission of suicidal behavior. We also review the findings on physical/sexual abuse, which occurs predominantly within families, because abuse has been strongly related to suicidal behavior.

## Familial Transmission of Suicidal Behavior

Adoption studies, twin studies, and family concordance rates for suicidality and psychopathology all support the notion of familial transmission of suicidal behavior.

**ADOPTION STUDIES** Schulsinger et al. (1979) examined suicide rates among biologic and adopted relatives of persons who committed suicide and in a matched control group of living adoptees in Denmark. The biological relatives of adoptees who had committed suicide were six times more likely to commit suicide than were the relatives of controls. In addition, there were no suicides in the adopted relatives of the suicide victims. However, the study design negated the ability to determine if the increase in suicide was related to a psychiatric disorder or directly to suicidal behavior. Wender et al. (1986), in a mood disorder adoption study also conducted in Denmark, found that the highest suicide rates were in the biological relatives of adoptees with personality disorders characterized by impulsivity and aggression. This study raises the possibility that suicide is transmitted via this impulsivity/aggression personality characteristic independent of mood disorder.

**TWIN STUDIES** Twin studies also demonstrate that suicidality is heritable. Statham et al. (1998), in a study of nearly 6000 twins in Australia, found that the concordance rate for suicide attempts was much higher in monozygotic than in dizygotic twins (23% versus 0%). If one monozygotic twin made an attempt, the other twin was 3.8 times more likely to also make an attempt. Heritability was estimated at 55% for a serious suicide attempt. Glowinski et al. (2001) studied 3416 female twins and found a concordance rate of 25% for suicide attempts among monozygotic twins and 12.8% in dizygotic twins. After adjusting for psychiatric comorbidity and history of abuse, the odds ratio for an attempt was similar between monozygotic (5.6) and dizygotic (4.0) twins. A heritability estimate of 38% was found, but the small sample size affects confidence in this finding. Fu et al. (2002) examined 3372 twins in the Vietnam Twin Registry and found that monozygotic twins were more likely to be concordant for a suicide attempt (adjusted odds ratio = 12.1) than were dizygotic twins (adjusted odds ratio = 7.4). After adjusting for psychiatric, historical, and demographic variables, the heritability estimate was 17.4% for suicide attempts.

**SUICIDAL BEHAVIOR IN FAMILIES** In a recent review of studies comparing the rates of completed and attempted suicide within families (Brent & Mann 2005), rates

of suicidal behavior were consistently found to be higher in families of suicidal adolescents than in community or psychiatric controls. For example, in a psychological autopsy study (Brent et al. 1994b), first-degree relatives of adolescent suicide completers were more likely than first-degree relatives of controls to have been diagnosed with a psychiatric disorder, including any affective disorder, alcohol abuse, or drug abuse, and to have a history of a suicide attempt.

The rate of suicide attempts in first- and second-degree relatives of adolescent suicide completers does not appear to be explained simply by the presence of psychiatric disorders within the family. A registry study in Denmark determined that, after controlling for parental psychiatric disorders and other related historical factors, adolescent suicide was more likely if the adolescent's parent died by suicide—about fivefold for a maternal suicide and twofold for a paternal suicide (Agerbo et al. 2002). Gould et al. (1996) found that suicide victims were more likely than controls to have had a mother with a history of mood disorder symptoms, a father with a history of legal troubles, and a family history of suicidal behavior. However, only father's history of trouble with the police and a family history of suicidal behavior significantly increased the risk of suicide beyond the risk attributed to the adolescent's psychopathology. The rate of family suicidal behavior was five times greater in the families of adolescent suicide victims than in controls. Similarly, Brent et al. (1996a) found higher rates of attempted and completed suicide in the first-degree relatives of completers than in controls, even after controlling for psychiatric disorders in the relatives. Although the relatives of completers were twice as likely as controls to report suicidal ideation, this difference was no longer significant after taking into account family psychopathology. Brent and colleagues concluded that it is specifically suicidal behavior, not ideation, that is transmitted in the family. In addition, rates of suicidal behavior in families were much higher in adolescent suicide victims with aggressive behavior than in those with low levels of aggressive behavior.

Several studies examining familial suicidal behaviors in community and clinical samples of adolescent suicide attempters have yielded findings comparable to suicide completers (Brent & Mann 2005). Brent et al. (2002) found that the offspring of attempters were six times more likely than the offspring of nonattempters to be at risk for a suicide attempt. The large majority (82%) of the attempters were also diagnosed with a mood disorder. Parental psychopathology is also commonly found in these families. In the Brent et al. (2002) study, a history of sexual abuse and impulsive aggression in both the parent and adolescent increased the risk of an adolescent's attempt. In another study, Brent et al. (1993d) found that parental depression increased the risk of an adolescent's suicide, even after controlling for the adolescent's depression. Using a community sample, Fergusson & Lynskey (1995) found substance abuse and antisocial behavior to be more common in the families of 29 adolescents with a history of suicide attempts than in 925 adolescents without a history of suicide attempts.

Overall, these studies suggest that familial psychiatric disorders play a significant role in attempted and completed suicide. However, psychiatric disorders do

not completely account for suicidal behavior, and there appear to be factors specific to the transmission of suicidal behavior in some families (Brent & Mann 2005, Joiner et al. 2005, Wagner et al. 2003). For example, in the previously discussed study, Brent et al. (2003) found that impulsive aggression was strongly related to familial transmission of early-onset suicidal behavior. In the presence of other risk factors, a family history of suicide attempts greatly increases the risk of a suicide attempt in the adolescent.

## Physical and Sexual Abuse

A number of investigations support the role of physical and sexual abuse in adolescent suicidal behavior, but results are inconsistent. Silverman et al. (1996) conducted a longitudinal study in which adults who reported being abused prior to the age of 18 were compared with those not reporting abuse. As adults, the abused participants reported more psychiatric symptoms, suicidal ideation, and suicide attempts than did their nonabused counterparts. Molnar et al. (1998) examined abuse and suicide attempts in a large sample of street youths. Sexual and physical abuse before leaving home were independent predictors of suicide attempts. A history of abuse increased the odds of attempting suicide two- to fourfold. In a large sample of high school students, adolescents with a history of sexual abuse were found to be 12 times more likely to make a noninjurious suicide attempt and 47 times more likely to make an injurious suicide attempt than were adolescents without a sexual abuse history (Bensley et al. 1999). A history of physical abuse placed an adolescent at a 5-times higher likelihood for a noninjurious attempt and a 12-times higher likelihood for an injurious suicide attempt.

Overall, abuse does seem to increase risk for suicidal behavior (Gould et al. 2003). However, many psychiatric patients report abuse, and in some studies, abuse is not specifically related to future suicidal behavior (Commission on Adolescent Suicide Prevention 2005).

For example, Brent and colleagues (1993a) followed 134 adolescents for six months after discharge from a psychiatric unit. Thirteen of the adolescents attempted suicide, but the attempters did not differ from the adolescents who had not attempted suicide on their history of physical or sexual abuse. Inconsistent findings may be related to definitional variations both in sexual abuse and suicidal behavior, differing samples, and cross-sectional versus longitudinal studies (Rogers 2003). Further, the relationship between sexual abuse and suicidal behavior is likely moderated by or interacts with any number of factors. For example, it appears that sexual abuse is more strongly related to suicidal behavior in males than in females (Evans et al. 2004) and under low versus high conditions of social support (Esposito & Clum 2002).

Evidence also suggests that abuse may influence suicidal behavior through an association with impulsivity and aggression (Baud 2005) or by negatively affecting neurobiological development. Based on animal research, Mann (2003) speculates

that overactivity of the hypothalamic-pituitary-adrenal (HPA) axis and alteration in some neuropeptide systems as a result of abuse may be the neurobiological factors that are related to suicidality in abused children and adolescents. Further, Brent & Mann (2005) note that sexual abuse is common in the parents of sexually abused children and that these parents often have histories of psychiatric disorders and suicidal behavior that is transmitted to their offspring. In these distressed families, both the environment and genetic factors increase risk for offspring suicidal behavior.

## ENVIRONMENTAL FACTORS

Several environmental factors, e.g., firearm availability, have been related to attempted and completed suicide during adolescence. We review two prominent risk factors below: exposure to a suicidal peer and stressful life events.

### Exposure to Suicidal Behavior

The evidence of psychiatric sequelae in friends and acquaintances of adolescent suicide victims is limited. A series of studies found no significant differences in the rates of suicide attempts between adolescents exposed to adolescent suicide and unexposed controls at short-term (Brent et al. 1993e) and long-term (three years; Brent et al. 1996b) follow-up. Suicidal ideation was more common among the exposed group but was nearly entirely explained by an increase of depression (Brent et al. 1993e). In fact, significant depressive and posttraumatic stress symptoms were evident up to three years after exposure to suicide (Brent et al. 1996b). Brent and colleagues hypothesized that adolescents within the social network of suicide completers may be inhibited from acting on suicidal ideation because of their firsthand knowledge about the consequences of suicide on significant others (Brent et al. 1993e, 1996b).

In contrast, evidence from a recent study (Ho et al. 2000) is inconsistent with the findings of Brent and colleagues. Ho et al. (2000) found that peers of suicide completers demonstrated an elevated risk of suicidal ideation, plans, and acts relative to controls. In addition, the presence of psychiatric disorders did not entirely explain the increased risk of suicidal behaviors (Ho et al. 2000). Thus, further research is needed to reconcile findings regarding suicide risk among peers of suicide completers.

Relative to research on the peers of adolescents who complete suicide, there has been much less emphasis on the mental health and suicide risk among peers of suicide attempters. There is preliminary evidence that the peers of suicide attempters have an elevated risk of psychopathology and suicidal behavior, even relative to the peers of suicide completers. In comparison with nonexposed controls, peers of suicide attempters report significantly higher rates of suicidal ideation (40% versus 14%) and suicide attempts (21% versus 5%; Ho et al. 2000).

## Stressful Life Events

Stressful life events have been associated with completed suicide in adolescence even after controlling for psychiatric symptoms (see, e.g., Gould et al. 1996). Death of a parent and early parental loss in general seem to be particular life events that increase the risk of attempted and completed suicide (Agerbo et al. 2002, Overholser 2003). The types of life events that are related to suicidal behaviors also vary with age. Younger attempters report more family/parent conflict, whereas older adolescents report interpersonal stressors (Overholser 2003).

There is equivocal evidence that suicidal adolescents experience more stressful life events than do other nonsuicidal counterparts (Overholser 2003). It seems that experiencing a large number of stressful life events is a nonspecific risk factor that results in negative affect which in turn leads to suicidal behavior in some adolescents. However, some stressors that precipitate suicidal behavior may be specific to various pre-existing psychiatric disturbance. That is, legal problems are more common in adolescents with disruptive behavior disorders, while interpersonal losses are more common in adolescents with substance use disorders (Gould et al. 2003).

## HIGH-RISK GROUPS

Identifying high-risk groups for suicidal behavior is an important way to tailor prevention and intervention efforts. Preventive efforts can be applied to the high-risk groups as a whole to help reduce the onset of suicidal behavior. Alternatively, high-risk adolescents can be individually screened to identify those in need of intervention. Several examples of high-risk populations are discussed below.

### Gay, Lesbian, and Bisexual Youths

The process of exploring sexual orientation and “coming out” is a central developmental task for gay, lesbian, and bisexual (GLB) youths that often creates unique internal and interpersonal stresses—including parental rejection, peer isolation, and victimization—that may lead to suicidality (McDaniel et al. 2001). Rates of adolescent suicide attempts appear to be higher among GLB youths than heterosexual youths, but completed suicide is comparable across GLB and heterosexual youths (McDaniel et al. 2001). Remafedi et al. (1998) cite eight peer-reviewed studies that found attempted suicide rates ranging from 20% to 42%. A recent review of the literature concluded that GLB youths have a rate of suicidal behavior two to six times greater than that of heterosexual youths (McDaniel et al. 2001). Even larger differences have been found for suicide attempts requiring medical treatment.

Remafedi and colleagues (1998) examined gender differences in the prevalence of suicidal behavior among GLB versus heterosexual high school students. Interestingly, GLB males and females had similarly high rates of reported suicidal behavior, but only GLB males differed significantly from their heterosexual



male counterparts (Remafedi et al. 1998). In comparison with heterosexual males, GLB males had significantly higher rates of suicide ideation (31% versus 20%), attempts (28% versus 4%), and intent (15% versus 4%). Thus, there appears to be a significant interaction between gender and sexual orientation in regard to suicide risk.

## Homeless and Runaway Youths

Homeless and runaway youths report very high rates of attempted suicide. In one study, 25% of female and 14% of male runaways reported a history of attempted suicide (Leslie et al. 2002). When street youths are included in surveys, the rates of attempted suicide are usually higher, e.g., 42% (Smart & Walsh 1993).

Yoder (1999) examined psychosocial variables that distinguish suicide attempters, ideators, and nonsuicidal youths in a sample of 527 homeless and runaway adolescents in the Midwest. Relative to suicide ideators and nonsuicidal youths, adolescents with at least one prior suicide attempt were more likely to have experienced physical or sexual abuse by an adult caregiver or to have experienced sexual victimization on the streets, to have a family history of emotional difficulties, and to have a friend who attempted suicide (Yoder 1999). Leslie et al. (2002) found that suicide ideation and attempts in runaways were related to identifying oneself as gay. Further, heightened emotional distress and fewer conduct problems predicted suicidality in males, whereas lower self-esteem, emotional distress, and negative life events experienced in the streets predicted suicidality in females.

## Incarcerated Adolescents

Current research generally reveals incarcerated adolescents to be at high risk for engaging in suicidal behavior. In a study by Morris et al. (1995) of 1801 incarcerated adolescents across 39 facilities in the United States, approximately 22% reported that they seriously considered suicide, 20% made a suicide plan, 16% made at least one attempt, and 8% were injured as the result of a suicide attempt. Compared with data reported from high school students who completed the YRBS in the same year, rates of suicide attempts (15.5% versus 7%) and injury resulting from attempts (8.2% versus 2%) were much higher in the incarcerated population. The risk seems heightened for females, as 35% of incarcerated females reported making a suicide attempt within the prior year compared with only 11% of high school females. Of those adolescents who made an attempt, 20% of incarcerated females sustained injury, whereas injury occurred in only 2% of high school females. For males, those incarcerated reported twice as many suicide attempts and resulting injuries as high school males. Racial differences also emerged between populations. White youths reported the highest suicide rates, followed by Native American Indian/Alaskan Native youths in the incarcerated population, whereas Hispanic followed by white and African American youths reported the highest suicide rates in the high school population (Centers for Disease Control 1991).

## NEUROBIOLOGY OF SUICIDE

The neurobiology of suicide is complicated and findings are far from straightforward. The majority of research has focused on the serotonergic system. Decreased levels of a 5-hydroxy-indoleacetic acid (5-HIAA) have been reported in the cerebrospinal fluid of suicidal persons in some, but not all, studies (Joiner et al. 2005). Some studies have found low 5-HIAA to be related to severity of a suicide attempt and future attempts. In addition, low 5-HIAA has been related to lifetime level of aggression and has been linked to impulsivity, suggesting that the effects on suicidal behavior may operate through impulsivity.

Postmortem analyses of the brains of persons who completed suicide have not revealed consistent results regarding serotonin transporter binding (McGuffin et al. 2001), although some studies suggest reduction in binding is most pronounced in the ventral prefrontal cortex, including the only study of teenage, rather than adult, suicide victims (Pandey et al. 2002). Because damage to the ventral prefrontal cortex may lead to impulsive responding, problem-solving deficiencies, and reactivity to environmental stressors, its potential to affect suicidal behaviors is quite plausible.

The HPA axis has also been suggested to play a role in suicidal behavior. Most studies in this area have used nonsuppression of cortisol in response to a dexamethasone suppression test as an indication of hyperactivity of the HPA axis. Like the areas reviewed above, evidence is mixed in regard to this hypothesis (Mann 2003).

Candidate genes have also received attention in the literature, in particular, the serotonin transporter (5-HTT) genes. Although several studies have indicated that the s allele increases the risk for attempted and completed suicide, there are also contradictory findings that limit the ability to draw any conclusions regarding 5-HTT (Joiner et al. 2005). Other candidate genes such as tryptophan hydroxylase, 5-HT<sub>2A</sub>, and catechol-o-methyltransferase have also been found to be related to suicidal behavior in some studies. Impulsivity has been found to be at least partly heritable, and this genetic influence seems to be shared with impulsive (irritable) aggression (Baud 2005). Dysfunctional 5-HT has been related to impulsive and aggressive traits in suicide attempters. It is clear that there are complicated relationships between genes and the expression of suicidal behavior, that these genes may express themselves through their influence on impulsive and aggressive behavior, and that multiple genes combine to result in suicidal behavior (Joiner et al. 2005).

Overall, when an association between neurobiologic findings and suicidal behavior has been found, these findings typically appear specific to serotonin but not to other neurotransmitters. Decreased serotonergic functioning is typically found both in individuals who attempt suicide and complete suicide. As in the genetic studies, impulsivity and aggression may be the mechanism through which decreased serotonergic activity is related to suicidal behavior.

## PRIMARY PREVENTION OF SUICIDAL BEHAVIOR

A number of approaches have been taken to prevent suicidal behavior, including implementing firearm restriction programs and training responsible adults who interact frequently with adolescents as gatekeepers for identifying and referring at-risk adolescents. The Commission on Adolescent Suicide Prevention (2005) provides a thorough review and critique of these programs. Below we review the two most commonly used approaches in schools, awareness and screening programs.

Suicide awareness programs have been advocated as a way to help adolescents become more sensitive to identifying a peer in suicidal crisis and to help the suicidal teen get the professional assistance that is needed. The first generation of suicide awareness/prevention programs typically contained didactics about suicide awareness signs, role-play encounters with suicidal peers, a videotape depicting a suicidal teen, and education for teachers and school staff. Most of these programs demonstrated an improvement in knowledge, attitudes toward suicidal peers and help seeking, and willingness to seek help if distressed (Gould et al. 2003). These programs only rarely found reductions in suicidal behavior, and some programs have demonstrated negative effects, i.e., hopelessness and maladaptive coping responses in males and adolescents with a history of suicidal behavior (Gould et al. 2003).

Many researchers believe that awareness/prevention programs should be developed for specific population subgroups, such as the Zuni Life Skills Curriculum for Native American Youth (LaFromboise et al. 1995). Thompson et al. (2001) identified students at high risk for dropping out of school. These adolescents then completed a screen, and those who met criteria were referred to a school-based program. High-risk students were then randomized to standard school procedures, a brief individual evaluation plus a single intervention session, or a 12-session peer group life skills training program. The two experimental conditions were found to be equally effective in reducing suicidal ideation, hopelessness, and depression compared with standard care. The peer group life skills training program was most effective in improving problem-solving skills and enhancing personal control (Thompson et al. 2001).

More recently, universal screening programs have been advocated as a means of suicide prevention. These programs are designed to identify and refer students with psychiatric symptoms who are at risk for suicidal behavior. The Columbia Teen Screen is the best known of these programs (Shaffer & Craft 1999). Students first complete a brief self-report scale and then move to the second level of screening if they endorse a suicide attempt, suicide ideation, or high scores on depression or substance abuse items. The second level of screening involves completing a voice-activated structured psychiatric diagnostic interview (Diagnostic Interview Schedule for Children; Shaffer et al. 1996b). If the adolescent meets criteria for a psychiatric disorder, an interview with a clinician is scheduled and referral to treatment is arranged, if indicated.

In one study, in which the Teen Screen was administered to 2000 high school students in New York City, many adolescents with previously unrecognized psychiatric symptoms were identified (Shaffer & Craft 1999). This raises concern as to whether enough services are available for identified adolescents. However, in a small sample ( $n = 122$ ), only 20% of students referred to treatment went to their first appointment and 25% to more than one appointment (D. Shaffer, personal communication). Another concern is that school administrators prefer staff in-service training and curriculum-based training to screening programs (Scherff et al. 2005), which may hold implications for the implementation of such screening programs. Finally, there exists concern as to whether screening for suicidality triggers subsequent suicidal ideation and behavior. To examine this question, Gould et al. (2005) randomly assigned 2342 high school students participating in the Teen Screen to complete a baseline survey with or without items about suicidality. There were no differences between groups in a measure of distress administered immediately after the survey or at follow-up in either low- or high-risk youths.

The prevention program with the best evidence base to date combines an education awareness component on depression and suicide, which teaches participants that suicidal behavior is related to psychiatric disturbance, with a screening program. The Signs of Suicide program has demonstrated a 145% increase in help-seeking for up to three months following completion of the program, and a 68% increase in help-seeking on behalf of friends. Most importantly, the students who completed the Signs of Suicide program made 44% fewer suicide attempts compared to controls (Aseltine & DeMartino 2004).

## TREATMENT RESEARCH WITH ADOLESCENT SUICIDE ATTEMPTERS

Suicide ideation is not typically the primary focus of treatment studies. Rather, ideation is an outcome marker or mediator, particularly in studies of depression. In a clinical trial comparing cognitive behavioral therapy, systematic behavioral family therapy, and nondirective supportive therapy for depressed adolescents, Barbe et al. (2004) examined baseline suicidal ideation/behavior as a mediator of treatment outcome. Suicidal depressed adolescents had a higher dropout rate and were more likely to be depressed at the end of the trial. Further, severity of depression and hopelessness predicted poorer outcomes, leading the authors to conclude that hopelessness should be targeted in the initial phases of treatment with suicidal depressed adolescents. The treatment outcome literature on adolescent suicide attempters is small. Reviewed below are factors associated with treatment outcome in general, followed by selected nonrandomized and all randomized trials with adolescent suicide attempters. Studies of pharmacologic treatments specifically designed to reduce suicidal behavior have not been reported in adolescents.

Treatment of adolescent suicidality may be affected by several factors, such as parental functioning and treatment adherence. In a clinical trial testing

psychosocial treatments for adolescent depression, maternal depression significantly diminished the positive effects of cognitive behavioral treatment (Brent et al. 1997). Treatment adherence also tends to be a problematic issue. Although even nonsuicidal adolescents attend relatively few psychotherapy sessions, psychotherapy attendance appears to be worse among those adolescents who have attempted suicide (Boergers & Spirito 2003). Further, most suicide attempters who follow through with a psychotherapy referral fail to complete an adequate course of treatment.

Treatment adherence has been found to vary as a function of type of outpatient treatment. King et al. (1997) studied adolescent suicide attempters and ideators following a psychiatric hospitalization. The patients were most compliant with their outpatient medication visits (67%), followed by individual therapy (51%), and then family therapy (33%). However, treatment attendance is not just a function of patient/family commitment. Often, service barriers, e.g., placing patients on waiting lists, transferring patients from one therapist to another, inflexible hours, etc., can play a role in impeding a family's access to treatment (Spirito et al. 2002).

## Individual Psychotherapy

Rathus & Miller (2002), using a quasi-experimental design, compared the treatment efficacy of Dialectical Behavioral Therapy (DBT,  $n = 29$ ) to treatment as usual (TAU) for 82 suicidal adolescents (one-third were attempters) with borderline features. Adolescents in both groups attended approximately 24 sessions over three months. The DBT group, which had more severe baseline symptomatology than the TAU group, had fewer psychiatric hospitalizations and higher rates of treatment completion than the TAU group. About 40% reattempted over the course of treatment, but no differences in repeat suicide attempts were found.

Donaldson et al. (2005) completed the only randomized trial with adolescent suicide attempters. Both treatments were delivered in an individual format with conjoint parent-adolescent sessions. Adolescents who had attempted suicide were randomized to either 10 sessions of the skills-based treatment ( $n = 18$ ) or the problem-oriented treatment ( $n = 17$ ). In the skills-based treatment, the adolescents were taught both problem-solving and affect management skills. Seven different therapists provided both treatments to control for therapist effects. More than half of those in the sample were multiple attempters. Participants in both conditions improved on suicidal ideation and depression at three- and six-month follow-ups, but there were no between-group differences.

## Family Therapy

In a highly structured, six-session outpatient family therapy program called "SNAP" (Successful Negotiation/Acting Positively), problem-solving skills were taught and then practiced through role-playing, modeling, and feedback. Negotiating, active listening techniques, and strategies for managing affective arousal were also taught. Although a randomized trial was not conducted, SNAP reduced overall

symptom levels among 140 female minority adolescent suicide attempters (Rotheram-Borus et al. 2000). Only one randomized family-focused intervention has been described in the literature. Harrington and colleagues (1998) randomly assigned 162 adolescents who had attempted suicide either to routine care or routine care plus a four-session home-based family intervention. The additional home-based intervention resulted in reductions in suicidal ideation at six-month follow-up, but only for adolescents without major depression. There were no differences in the rate of suicide reattempts.

## Group Therapy

There have been two randomized trials of group psychotherapy. Wood et al. (2001) randomized 63 adolescents who had deliberately harmed themselves on at least two occasions within a year to group therapy plus routine care or routine care alone. The group therapy approach utilized cognitive-behavioral and DBT techniques. The intervention included attendance at six "acute" group sessions, which focused on specific topics, followed by weekly process-oriented long-term group therapy, which could continue until the patient felt ready to terminate sessions. Adolescents in routine care attended a median of four sessions (range = 0–30). Adolescents who received group therapy were less likely to make more than one repeat suicide attempt than were adolescents who had routine care (2/32 versus 10/31; odds ratio 6.3). More sessions of group therapy were associated with a better outcome, but more sessions of routine care were associated with a worse outcome. The Wood et al. (2001) study is significant in the treatment of suicide attempters because it is the first study to demonstrate a reduction in repeat suicide attempts following treatment. It is equally significant that group therapy did not lead to iatrogenic effects, when other research has suggested that aggregating behavior problem youths can lead to deterioration of functioning (Dishion et al. 1999).

## Comprehensive Treatment Programs

Katz et al. (2004) compared the effects of an inpatient psychiatric hospital unit based on DBT to a traditional, psychodynamically oriented unit. Both units resulted in a significant reduction in suicidal ideation and behavior at one-year follow-up, but there was no difference between units. Two randomized studies have tested comprehensive treatment programs with suicide attempters. Rudd et al. (1996) devised a two-week day-treatment program for older adolescents and young adults (58% attempters). Group therapy occurred throughout the day and focused on psychoeducation, problem-solving, and traditional experiential-affective techniques. The experimental program resulted in improvements in suicidal ideation and behavior, but the comparison group, which received standard care in the community, had comparable improvement. However, further analyses revealed that patients with comorbid symptomatology experienced the most improvement with the problem solving–based experimental treatment (Joiner et al. 2001).

Huey et al. (2004) randomized adolescents presenting with psychiatric emergencies to either psychiatric hospitalization or multisystemic therapy (MST). MST is a family-focused home-based intervention that addresses home, school, and community factors related to youth difficulties, with a particular emphasis on parenting skills. A variety of behavioral interventions is typically delivered in MST. Caseloads are low for each therapist, and therapists receive frequent supervision. Treatment ranges from three to six months, with daily sessions as necessary. At one-year follow-up, the MST group had significantly lower rates of suicide attempts than the hospitalized adolescents. Suicidal ideation improved for both groups over follow-up, but there were no differences between the two groups on these variables.

In summary, the treatment literature is limited on suicide attempters, and studies are only just emerging that demonstrate effects on continued suicidal behavior. The high-risk nature of the population has discouraged researchers from working with these youths. However, recent recommendations on how to manage these high-risk patients in clinical protocols (Oquendo et al. 2004) may encourage more research.

## CONCLUSIONS AND FUTURE DIRECTIONS

Although the rates of adolescent suicide have been declining since the mid-1990s, suicide remains the third leading cause of death in this age group. In addition, the suicide rate among African Americans rose over the last decade, as did the rates of medically serious suicide attempts. A prior suicide attempt is one of the best predictors of a repeat attempt as well as eventual completed suicide. Heterotypic comorbidity, i.e., having both an internalizing and externalizing disorder, such as mood disorder with disruptive behavior or substance use disorder, greatly increases the risk for attempted and completed suicide.

Familial psychiatric disorders place an adolescent at risk for psychopathology in general as well as the suicidality that often accompanies psychiatric disorders. However, there also appear to be factors specific to the transmission of suicidal behavior in some families. Suicidal behavior in families seems to be related to the transmission of specific suicidal risk, risk for psychiatric disorders, and risk for impulsive aggression. Adoption and twin studies support the contention of a genetic component to suicidal behavior. Parents with impulsive aggression traits also are likely to have more conflictual and chaotic family functioning (Brent & Mann 2005). Thus, future research will need to disentangle how individual traits, such as impulsive aggression, interact with genetic factors and stressful family environments to result in suicidal behavior in adolescents.

The literature on the neurobiology of suicide has increased dramatically over the past decade and promises to be an exciting area of future research. The serotonergic system has been most widely studied, but findings are not consistent. The abnormalities in the serotonergic system that contribute to this relationship, e.g.,

either in the serotonin transporter or receptor systems, have not been elucidated to date. The precise link between genes, serotonergic activity, personality characteristics such as impulsive aggression, psychiatric disorders, and suicidal behavior will be difficult to elucidate given the complex nature of both the genotype and phenotype. Underlying traits and behavioral dimensions such as impulsivity may be more precisely measured than Axis I or Axis II psychiatric disorders and thus may prove easier to examine in relation to genetic factors and serotonergic dysfunction (Baud 2005).

Suicide education programs have been shown to affect knowledge and attitudes toward suicide. Prevention of suicidal behavior through suicide awareness programs has proven to be more difficult. One program, the Signs of Suicide Program, has demonstrated efficacy in this regard. This program combines screening and education, and results suggest that such a combined approach may be the best means of effecting behavior in general populations.

Only two psychosocial treatment studies to date have found an effect on continued suicidal behavior. No studies of pharmacotherapy alone have been reported. There is a clear need for additional studies in order to determine the best approaches to reducing repetitive suicidal behavior.

The treatment outcome literature on suicide attempters is small, partly because of investigator concerns about liability in clinical trials with such high-risk patients (Pearson et al. 2001). Other methodological difficulties encountered in treatment research include poor adherence to treatment protocols and the high likelihood of continued suicidality, the latter resulting in removal of patients from clinical trials. In addition, the need to treat both the suicidal behavior and underlying psychiatric disorder has proven to be a substantial challenge for researchers, complicated even further by the comorbidity commonly found in these adolescents.

The neurobiology of suicide suggests that pharmacologic treatments may be useful in the treatment of adolescents who attempt suicide, particularly multiple attempters. A standard algorithm guiding medication use may be the research design best suited to address the clinical and ethical realities of studying such a high-risk population. The complicated psychosocial factors associated with adolescent suicidal behavior will require that psychotherapy accompany any medication treatment.

Developing and testing multiple pathways to suicidal behavior will be important in future research. The development of models will help guide prevention efforts and help delineate differential treatments. Also important to investigate will be the protective factors that keep adolescents with high-risk profiles from progressing to suicidal behavior.

Finally, the next generation of research promises to integrate behavioral, brain, and genetics advances to improve our understanding of which subset of adolescents with major psychiatric disorders are also at risk for serious suicidal behavior. Understanding these individual genetic and neurobiologic vulnerabilities will hopefully lead to tailored interventions that have the greatest likelihood of affecting suicidal behavior.



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